1,042,780

PATENT SPECIFICATION

DRAWINGS ATTACHED

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Int. Cl.:—F 06 d//F 06 l

COMPLETE SPECIFICATION

Tool-joints for Drill Strings

I, DEPUTY MINISTER OF THE MINISTERUL INDUSTRIEI PETRILULUI SI CHIMIEI, of 1, Scaune Strode, Bucharest, Rumania, do hereby declare this invention, for which I pray that a Patent may be granted to me, and the method by which it is to be performed, to be particularly described, in and by the following statement:—

The present invention relates to joints for a drill string which joints unlike conventional joints, are made up by use of an elliptic-cylindrical system.

Known drill string joints are of the "coarse thread" type and making or breaking a joint implies screwing. The threaded connections have the disadvantage that for tripping in or out the drill string while drilling, a number of complicated manual or automatic tools are necessary to make or break the connection. It generally takes about 70 seconds for a drill string to be made up or broken out. Taking this as a basis, the assembling time for a drill string comprising stands 27m in length and corresponding to a 3000m deep hole, will be approximately 2 hours.

Automatic means for the make and break operations for a drill string vertically positioned in the well-bore, requires special equipment for the tongues and other tools used to screw in the joint, and such equipment is usually expensive.

In order to eliminate the threaded connections, where stresses are located and failures usually occur, according to the invention a new joint type has been developed, which employs an elliptic-cylindrical connecting system. These joints are flash welded to the drill-pipe.

It is to be noted that in the known drilling techniques the drill string permits the bit to rotate in only one direction. Laboratory tests have shown that depending upon the formation lip, operation of the roller bit will be more efficient in penetrating the rocks with left hand rotation of the bit. The rotating direction must therefore be chosen as dictated by the formation dip and by the relative position of the bit to the formation.

According to the invention there is provided a joint comprising a male member and a female member wherein the male member has an elliptical sectioned part, the female member has an elliptical recess into which the elliptical part of the male member fits and the female member as an opening into which a locking member is received to retain the male member in engagement with the female member whereby left and right hand rotation may be transmitted through the engaging elliptical parts. In these drill-string types the threaded connections are eliminated.

For illustration purposes an example of the tool joint of an elliptic-cylindrical type according to the invention, will be given and shown diagrammatically in Figs. 1—8 of the accompanying drawings.

Fig. 1 shows the outside view of the tool joint shown separately as pin and box;

Fig. 2 shows a locking member for holding in place the pin and the box of the elliptic-cylindrical type tool joint;

Fig. 3 shows the inner elliptic shape of the tool joint box;

Fig. 4 shows the pin and box of Fig. 1 in engagement;

Fig. 5 shows the pin and box of Fig. 1 about to be engaged;

Fig. 6 shows a modification;

Fig. 7 shows the elliptic-cylindrical joint when completely assembled; and

Fig. 8 shows longitudinal and cross-sectional views through the elliptic-cylindrical tool-joint.

Referring now to the drawings Figs. 1 to 5, a joint for drill rods comprises a male part or pin A on one rod and a female part or box B in the other rod. The pin A

comprises four sections 1, 2, 3 and 4. The sections 1, 3 and 4 are cylindrical. Section 2 is of elliptical cross-section. The lowest section 4 is fitted with a rubber sealing sleeve similar to that used for the pistons of mud drilling pumps. A circular section bore passes co-axially through the pin for the circulation of drilling mud.

The box B has a bore 5 therethrough and a cylindrical outer surface. This bore 5 is of elliptic cross-section corresponding to surface 2 at its upper part 7. An opening passes through the wall of the box and has semi-circular end surfaces 9 and 9*a*. A locking member 6 (Fig. 2) fits into the opening to lock the pin A in the box B as will be hereinafter described. The area of each surface 9 and 9*a* is two to three times larger than the cross-sectional area of the corresponding drill-pipes. The members 6 when in the opening act on surfaces 9 and 9*a* to form a connection capable of supporting axial loads and lock pin and box in engagement.

An axially extending channel (not shown) (in Figs. 1 to 5) but indicated by the line 10 in Fig. 4, is provided on the surface of box B. This channel is for engagement by a wedge on the bore of an outer sleeve 11 which surrounds the box B (as will be described). The sleeve 11 is locked in position on a ring 12.

The pin A and box B are provided with surfaces 13 and 14 respectively which abut when the pin A is home in the box B.

A groove is provided in the outer surface of the locking member 6 so that when inserted into the opening in the box B a band spring holds it in position. In the modification of Fig. 6, the spring is indicated by the numeral 15, in this case there are two locking members 6 and two openings in the box B.

The joint is assembled as follows:

The locking member 6 is moved out of the opening in the cylindrical box member B far enough to allow the pin A to be inserted therein.

The pin A is inserted into the box B until the shoulder 9*a* is level with the top of the lower curved portion of the apertures in the box member B. The locking member 6 is then urged inwardly into the apertures so that the complemental shoulders on its inner surfaces overlie and abut the shoulder 8. A band spring, similar to spring 15 encircles the locking member and lies in the groove provided in the outer surface thereof. The locking member is urged inwardly by means of a sleeve 11 (Fig. 7) which is slid upwardly to lock with a ring 12 at the same time locking the locking member 6 in position.

The connection is thus complete. Variable torque and rotation of the bit is transmitted through the elliptic section 2 of pin A and the elliptic part 7 of the box B, and the tensile axial stresses are transmitted by the members 6 through surfaces 9*a* and 9. In this way the external actions; torque and axial stresses are separately assumed by separate elements.

Dismantling of the connection is performed in the reverse order. The sliding sleeve 11 is moved down the rod to the lower shoulders thus uncovering the members 6.

The member 6 may automatically be removed by means of the magnetic field of a special device to allow disengagement with the pin part A. Alternatively the member 6 can also be removed manually by means of two holes provided in its body.

The joint aforedescribed offers the following advantages:

It eliminates the threaded connections of the drill string where stresses usually concentrate, resulting in frequent failure of the threaded parts.

It makes possible the application of left-hand or right-hand rotation of the bit while drilling, depending upon the relative position of the bit to the rock and the formation. This choice of direction of increasing the rotation results in an increase in penetration efficiency.

The need for using a great number of gauge types for checking tool-joint coarse threads is eliminated;

Tools and devices necessary for making up or breaking out tool-joints are eliminated from the drilling well equipment;

It eliminates drill string assembling and reduces the time necessary for these operations;

No complicated equipment for make and break operations is necessary, since the tool-joint does not call for specific screwing operations;

Application for drilling programs based upon pre-determined successive left-hand and right-hand rotation of the same bit, insures uniform wear of the bit elements;

The elliptic-cylindrical connection can also be used in sucker rod strings for pumping wells;

The use of the elliptic-cylindrical tool-joint permits the rapid connection of the cementing truck lines to the pipes in the bore hole while performing a cementing job.

WHAT I CLAIM IS:—

1. A joint comprising a male member and a female member wherein the male member has an elliptical sectioned part, the female member has an elliptical recess into which the elliptical part of the male member fits and the female member has an opening into which a locking member is received to retain the male member in engagement with the female member whereby left and right hand rotation may be transmitted through the engaging elliptical parts.

2. A joint as claimed in claim 1 wherein the male member has two cylindrical parts

which penetrate deeper into the female member than the elliptical part the cylindrical part adjacent the elliptical part being smaller than the elliptical part and the adjacent cylindrical part and the locking member engages between the elliptical part and the larger cylindrical part.

3. A joint as claimed in claim 1 or claim 2 wherein the locking member is resiliently held in position by a spring during insertion and removal of the male member.

4. A joint as claimed in any one of the preceding claims further comprising a sleeve to surround and lock the locking member in position when the male member has been positioned in the female member.

5. A joint as claimed in any one of the preceding claims comprising a plurality of locking members received in a corresponding plurality of openings in the female member.

6. A joint substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

7. A drill string comprising a plurality of drill rods joined together end to end by a joint as claimed in any one of the preceding claims.

Agents for the Applicant:
SYDNEY E. M'CAW & CO.,
Chartered Patent Agents,
Saxone House, 52—56, Market Street,
Manchester, 1.

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1042780 COMPLETE SPECIFICATION
3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

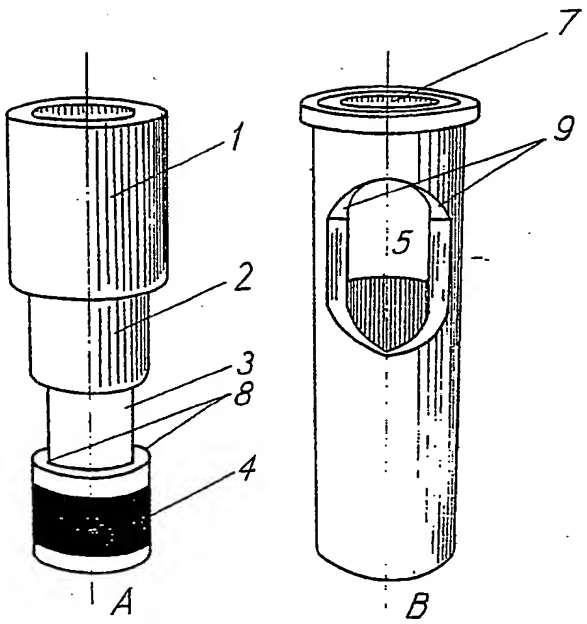


Fig. 1

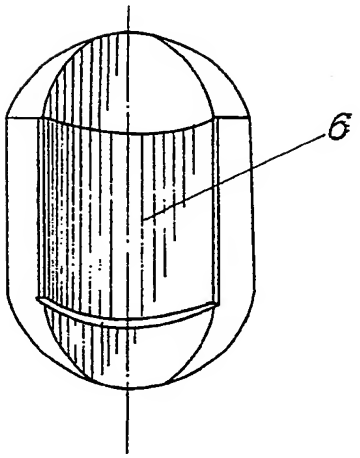


Fig. 2

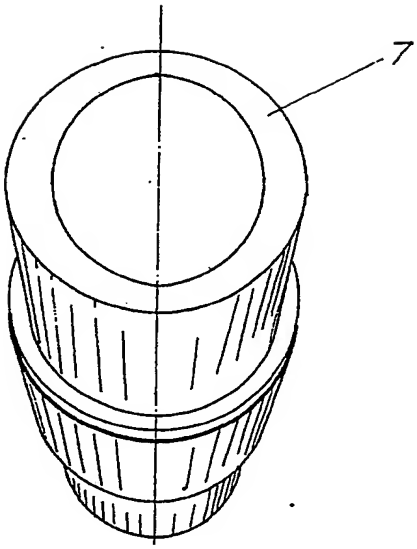
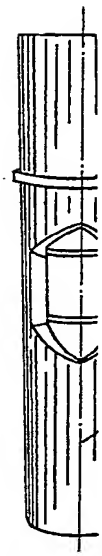


Fig. 3



Fig

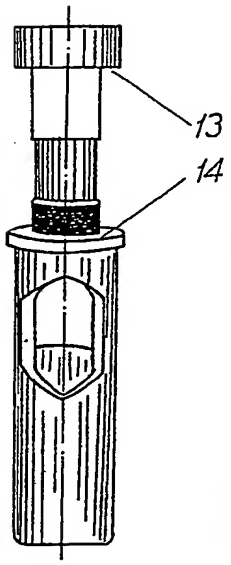


Fig. 5

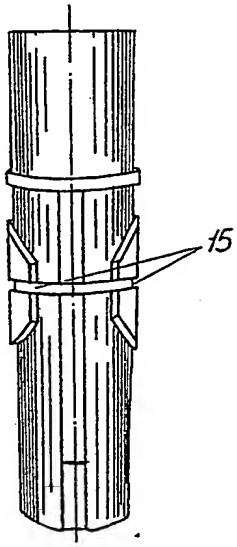


Fig. 6

Fig.

1042780 COMPLETE SPECIFICATION

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Sheets 2 & 3

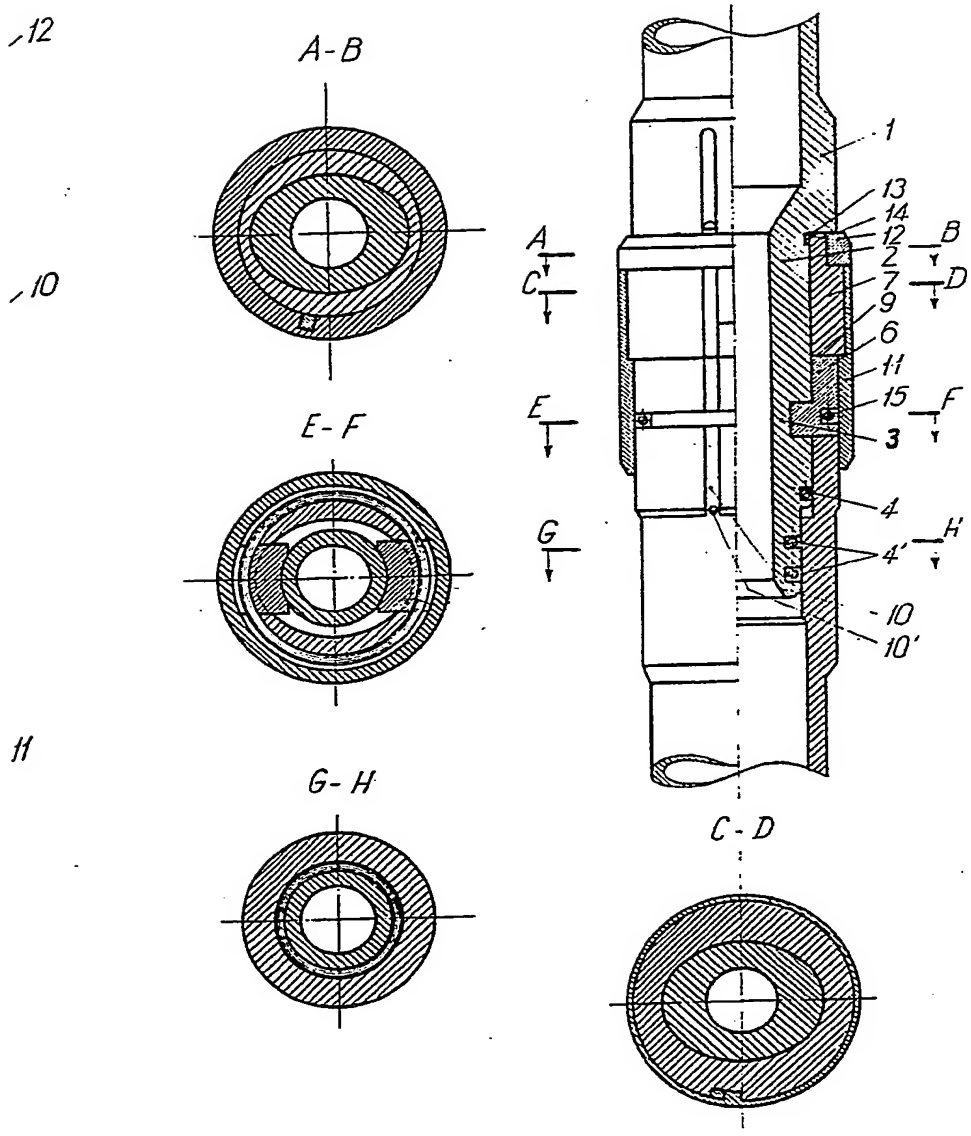

Fig. 8

1042780 COMPLETE SPECIFICATION
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Sheets 2 & 3

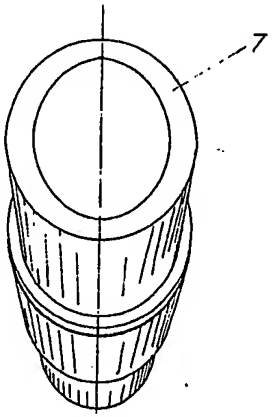

Fig. 3

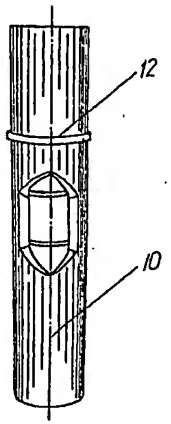

Fig. 4

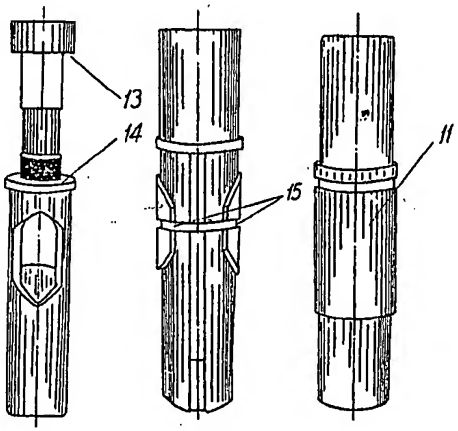

Fig. 5 Fig. 6 Fig. 7

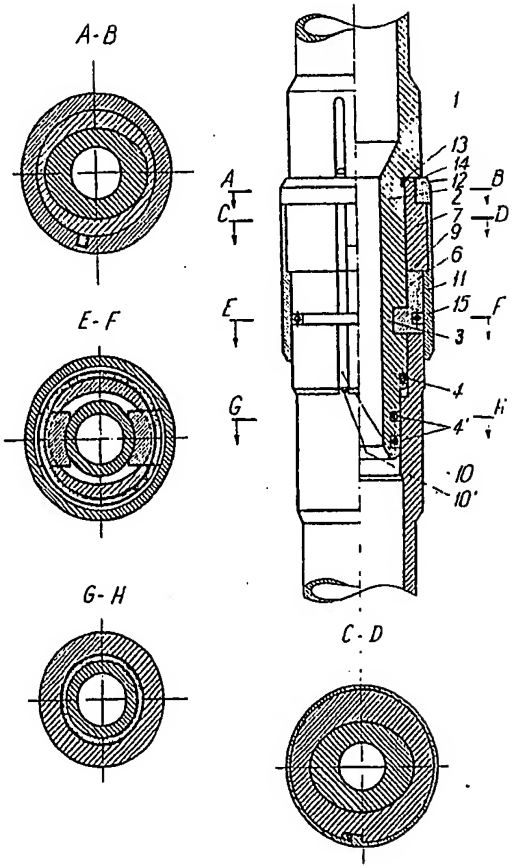

Fig. 8